
THE SPELEOLOGICAL HERITAGE OF KOSOVO ***TRASHËGIMIA SPELEOLOGJIKE E KOSOVËS***

Phd Cand. FADIL BAJRAKTARI

Kosovo Institute for Nature Protection, Prishtina, Republic of Kosovo,
fadilbajraktari@gmail.com

Prof. dr. ROMEO HANXHARI

Department of Geography, University of Tirana, Tirana, Albania,
romeo.hanxhari@unitir.edu.al.

Prof. as. dr. HAZIR CADRAKU

UBT- University for Business and Technology, Prishtina, Republic of Kosovo,
hazir.cadraku@ubt-uni.net

Abstract:

The speleological heritage holds an important place within the natural heritage of Kosova. In this paper we will make a categorization of the caves of Kosova: by their morphological and morphometric features, grouping them in vertical or horizontal ones; and by their values, like cultural heritage values, hydrological values, faunistic values, etc. Geological structures and lithological composition of carbonatic rocks have a decisive influence on the formation and development of speleological objects. The area of karst terrain in Kosovo is about 1,423.2 km² or 13.1% of the overall area of the country. Caves in Kosovo are very widespread, but only few of them are studied and very few open to visitors. In Kosovo, there isn't any study or full inventory of speleological objects, and therefore the exact number of them is not known. Up to date, there have been registered over 210 caves in Kosovo, but it is thought that their number is higher. Twenty (20) caves, with an overall area of 460.05 ha, have been taken under legal protection by local and central institutions in Kosovo, and this represents only 0.4 % of the overall area of protected areas. Caves in Kosovo have great natural, geological, geomorphological, hydrological, and cultural values and they are distinguished by a rich endemic biodiversity of fauna and flora. A considerable number of them that have been inhabited from the prehistoric period until the Middle Ages have cultural-historical values. The speleological objects have great speleotourism values and today they constitute an important potential for the sustainable development of tourism in Kosova.

Key words: *Kosovo, speleological objects, caves, karst terrains, natural values, protection, etc.*

Abstrakt:

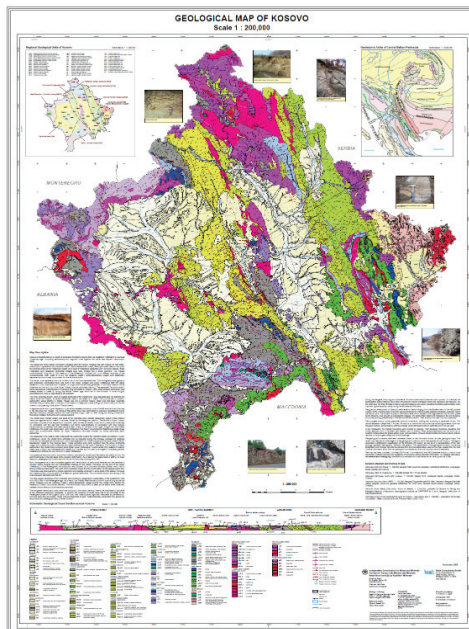
Trashëgimia speleologjike zë një vend të rëndësishëm në kuadër të trashëgimisë natyrore të Kosovës. Në këtë artikull do të bëjmë një klasifikim të shpellave të Kosovës: sipas kriterëve morfologjike dhe morfometrike duke i ndarë në shpella vertikale dhe horizontale; si edhe sipas kategorive të vlerave të tyre, si vlerat e trashëgimisë kulturore, vlerat hidrologjike, vlerat faunistike, etj.

Strukturat gjeologjike dhe përbërja litologjike e shkëmbinjve karbonatikë kanë një ndikim vendimtar në formimin dhe zhvillimin e objekteve speleologjike. Sipërfaqja e terreneve karstike në Kosovë është rreth 1423.2 km² ose 13.1 %, e sipërfaqes së përgjithshme të Kosovës. Shpella në Kosovë janë mjaft të përhapura, por pak nga to janë të studiuara dhe të hapura për vizitorë. Në Kosovë nuk ka një studim apo inventarizim të plotë të objekteve speleologjike, e për rrjedhojë nuk dihet numri i saktë i tyre. Deri me tani në Kosovë janë regjistruar mbi 210 shpella, por mendohet se numri i tyre është shumë më i madh. Nga institucionet lokale dhe qendrore në Kosovë janë marrë në mbrojtje ligjore 20 shpella (2023) të cilat përfshijnë një sipërfaqe prej 460.05 ha., ose 0.4 % të sipërfaqes së zonave të mbrojtur. Shpella në Kosovë kanë vlerat të mëdha natyrore, gjeologjike, gjeomorfologjike, hidrologjike dhe veçohen për një biodiversitet të pasur endemik të faunës dhe florës. Një numër i konsiderueshëm i tyre kanë vlera kulturore - historike që kanë qenë të banuara nga periudha parahistorike e deri në mesjetë. Objektet speleologjike ka vlera të mëdha speleoturistike dhe ato sot përbëjnë një potencial të rëndësishëm për zhvillimin e qëndrueshëm të turizmit në Kosovë.

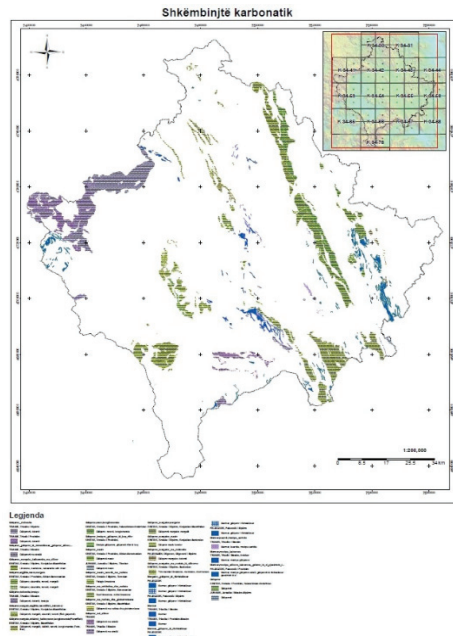
Fjalët kyçe: *Kosovë, objektet speleologjike, shpella, terrenet karstike, vlerat natyrore, mbrojtje etj.*

1. Introduction

Kosovo is situated in the central part of the Balkan Peninsula and has a suitable geographical position. Kosovo is distinguished by a complex geological construction, where the rocks were present from the Precambrian to the Quaternary period (Map 1). From the geological - tectonic aspect, Kosovo belongs to several tectonic zones: *Dardania Zone, Vardar Zone, Drenica Zone, Mirdita Zone, Bjeshkët e Nemuna (The Cursed Mountains) Zone and Sharr-Korab Zone*. The area in Kosovo is around 1423.2 km² or 13.1 % of the overall area of Kosovo. In these terrains geological formations there have been created objects of speleological heritage with many natural, scientific, archaeological, touristic and educational values, etc., (map 2).



Map 1. Geological map of Kosovo¹



Map 2. Distribution of carbonate rocks

Caves in Kosovo are quite widespread, but few of them are studied and very few are open to visitors. In Kosovo, there is not yet any full inventory of the caves, and therefore their exact features and conditions are not known. To date, over 210 caves and abysses have been registered in Kosovo, but it is thought that their number is much larger. From the current data (inventory) it can be concluded that caves may be found in all the horizons of the carbonate rocks, but mostly they are found in the rocks of Mesozoic era. The largest number of caves and abysses recorded to date are found mainly in the mountains of Bjeshkët e Nemuna (*The Cursed Mountains*), Mountain Akovan (Zatriq), Mountain Mokna, Mountain Pashtrik, Mountain Sharri, Mountain Drenica, Mountain Koretnik, as well as along the downstream of the Mirusha river. Among the most important caves in Kosovo are: the Cave in Gadime, the Grand Canyon Cave, the Cave in Radac, the Cave in Panorc, the Dushi Cave, the Peshterri (Zatriq) Cave, the Kusari Cave complex, the Large Cave in Gollostena, the Cave in Devetak (the Cave of Bats), the Black (Karamakazi) Cave, the Cave in Zatriq (Gërgavica), etc. The Cave in Gadime is well-known in Kosovo and the region, and is among the rare caves, in terms of the size of the corridors and galleries (1,260 m) and it is created in the marbled limestone rocks, as well as with the appearance of

¹ Source: ICMM - The Independent Commission for Mines and Minerals.

aragonite crystals of different shapes and sizes.

Caves in Kosovo are also distinguished by a large number of concretion forms like stalactites and stalagmites, columns, cave curtains, karst bathtubs, cave corals, stone flows, cave pearls, etc., which decorate them. These carbonatic concretions create ornaments of different shapes and sizes and with amazing colours are present in most of the caves in Kosovo. Kosovo caves are also distinguished by a very rich endemic biodiversity of fauna and flora (particularly bats, spiders and insects, etc.) but still not sufficiently researched. To date, only 20 are legally protected in Kosovo while several proposals have been made for the protection of a much higher number of caves.

In Kosovo, there are a large number of caves that were inhabited from the prehistoric period to the Middle Ages. Inhabited caves are mainly located near areas with suitable geoclimatic conditions and do have also suitable features like: geographical position, size, horizontally shaped floors, sufficient air ventilation, limited humidity, which were some of the main conditions that made these caves habitable.

2. The methodology of the study and the methodology of the categorization

The study is based on several sources of data, like: i) the data obtained from the use of contemporary written scientific literature; ii) - on the data obtained during the field exploration of the caves (photographs, coordinates, planimetric; iii) cartographical, measurements of the caves, collection of faunistic and archaeological specimens, etc.), in cartographic data (topographical, geological, hydrogeological, climatic and thematic maps, etc.); and iv) statistical data, in the form of tables and graphs; v), legislation, etc.

For the realization of this study, there were used a number of modern scientific methods and techniques, such as: *The method of direct observation in the field* - this was carried out through numerous field expeditions, in cooperation with local and international speleologists, local and central nature protection institutions, etc. Through this method there has been conducted direct observation of landscape forms and geological structures, geomorphological processes, cartographic measurements of caves and analysis of natural factors that have affected the creation of surface and underground karst forms. Likewise, through the hydrological observation, there was made the ascertainment of the hydrological connections between the surface water and the groundwater. Part of this method are the measurements of the corridors and galleries, as well as the photography of the spaces inside the caves.

Cartographic method - was used to cartographically represent the morphographic

and morphometric features of caves, on the basis of which it is determined the role of natural processes in the creation of caves and their values. This method has been of great importance in the realization of the map of the spatial extent of the caves in Kosovo. For the implementation of this method, there was used the application of GIS technology, which through the MapInfo10 computer program, enabled the creation of maps and databases.

The cadastral (inventory) method was used during the identification of objects of speleological heritage, where there have been collected a series of data on the location and features of karst objects of special value. Through this method, there have also been collected data on the biodiversity of caves, archaeological artifacts, water sources, etc. *Mathematical-statistical method* - was used for processing and analyzing numerical and statistical data, which are presented in the form of tables and graphs.

3. The categorization by morphological and morphometric features

3.1 The horizontal caves

From the speleological research and measurements that have been carried out thus far, the explored caves in Kosovo are 34 among which 22 are classified as horizontal and 12 are classified as vertical. The length of the explored corridors and galleries of the caves in Kosovo (2023) is 21612 m for those in horizontal and 664 m for those in vertical, but it is assumed that the length is much higher (table no.1).

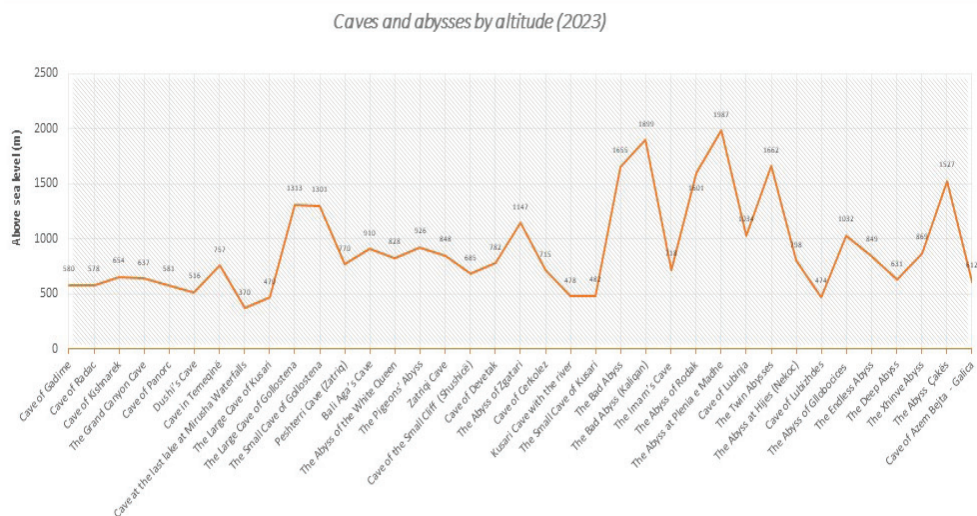
Table 1. Horizontal caves explored in Kosovo (2023)

No.	Name	Protection status	Year	Protected area - ha	Altitude (m)	Length (m)	Entrance H-horizontal	Municipality
1	Cave of Gadime	Protected	1969	38	580	1250	H	Lypjan
2	Cave of Radac	Protected	1983	90	578	3620	H	Pejë
3	Cave of Kishnareka	Protected	2006	2	654	170	H	Drenas
4	The Grand Canyon Cave	Protected, National Park (Bjeshkët e Nemuna)	2013	-	637	13954	H	Pejë
5	Cave of Panorc	Protected	2014	279	581	955	H	Malishevë
6	Dushi's Cave	Mirusha Waterfalls	2013	-	516	650	H	Klinë

7	Cave in Temeqinë	Protected	2014	0.69	757	33	H	Malishevë
8	Cave at the last lake at Mirusha Waterfalls	Mirusha Waterfalls	1983		370	22	H	Klinë
9	The Large Cave of Kusari	Protected	2018	5	470	102	H	Gjakovë
10	The Large Cave of Gollostena	Without status	-	-	1313	133	H	Istog
11	The Small Cave of Gollostena	Without status	-	-	1301	27	H	Istog
12	Peshterri Cave (Zatriq)	Protected	2016	70	770	34	H	Rahovec
13	Bali Aga's Cave	Protected	2016	1	910	36	H	Rahovec
14	Zatriqi Cave (Gërgavica)	Without status	-	-	848	93	H	Rahovec
15	Cave of the Small Cliff (Shushicë)	Without status	-	-	685	19.9	H	Istog
16	Cave of Devetak	Protected	2015	-	782	154	H	Shtime
17	Cave of Cerkoz	Without status	-	-	715	11.20	H	Istog
18	Kusari Cave with the river	Protected	2018	5	478	43	H	Gjakovë
19	The Small Cave of Kusari	Protected	2018	5	482	33	H	Gjakovë
20	Kusari Cave (1)	Protected	2018	5	481	22	H	Gjakovë
21	The Imam's Cave	Protected, National Park (Bjeshkët e Nemuna)	2013	-	718	55	H	Istog
22	Cave of Lubinja	Protected at NP "Sharri"	1986	-	1034	195	H	Prizren

The configuration of the karst terrains in Kosovo had such an effect so that the caves have a different extension in space, both in terms of altitude and exposure. The explored caves in Kosovo start from 370 m altitude and reach up to 1987 m altitude (but caves can also be found at lower or higher altitudes), figure 1.

Figure 1. Caves and abysses by altitude (2023)



3.2. The vertical caves

The most important abysses or vertical caves explored to date in Kosovo are: Humnerat Binjake (The Twin Abysses) or the bottomless abyss (-122 m), in Rrasa e Zogut (the Bird's Slab), Abyss of Zgatari (- 60 m), in Opojë, Humnera e Keqe (the Bad Abyss) (- 68 m) in Bajshë / Mokna Mountain, Humnera e Mretëreshës së Bardhë (the Abyss of the White Queen) (- 48 m), in Akovan / Zatriq, Humnera e Gjinve (the Jinns' Abyss) (- 45 m), in Pashtrik, Humnera e Gjinve (the Jinns' Abyss), (- 33 m) in Pashtrik, Humnera e Pëllumbave (The Pigeons' Abyss) (- 26 m), in Akovan / Zatriq, Humnera (shpellat) Binjake / the Twin Abyss (caves), (- 22 m) in Mokna Mountain, the Abyss of Rodak (- 49 m) in Mokna / Kaliqan Mountain, the Plenja e Madhe Abyss (- 42 m), in Mokna Mountain, Humnera e Keqe (the Bad Abyss) (- 82 m), in Mokna Mountain, at the Kaliqani Dairy Farms, etc., (table no. 2).

Table 2. Vertical caves explored in Kosovo (2023)

No.	Name	Name according to the local inhabitants	Depth (m)	Altitude	Mountain massif / location	Geological build-up
1	The Twin Abysses	The bottomless caves	-122	1662	Bjeshkët e Nemuna (The Cursed Mountains, Bjeshka e Stubllës (The Stubla Mountains))	Limestone of Cretaceous Age
3	The Bad Abyss	Cave of Holidaymakers	-82	1899	Mokna Mountain / Kaliqani Mountains	Middle and Upper Triassic limestones
3	The Abyss of Perqeva	Cave of Azem Bejta - Galica	-70	612	-	Middle Jurassic limestones
4	The Bad Abyss (Bajsh)	The Bad Cave	-68	1665	Mokna Mountain / Bajshë – Istog	Triassic limestones
5	The Abyss of Zgadari	The Big Cave	-60	1147	Sharri Mountains, (Opojë)	Triassic limestones
6	The Abyss of the White Queen	The Cave of the White Queen	-48	828	Akovan - Zatriq	Upper Cretaceous Limestones
7	The Abyss of Çaka	Cave of Çaka	-45	1527	Pashtrik Mountain – Planej village	Limestones of Cretaceous Age
8	The Abyss of Rodak	The Cave at Rexhep Imeri's Dairy Farm	-49	1601	Mokna Mountain, Kaliqani Mountains	Middle and Upper Triassic limestones
9	The Abyss at Plenja e Madhe	At the Dairy Farm of Halil Osmanaj/ Hajdeve)	-42	1987	Mokna Mountain, Kaliqani Mountains - Lubova	Middle and Upper Triassic limestones
10	The Jinns' Abyss	The Jinns' Cave	-30	-	Pashtrik Mountain – Planej	Triassic limestones
11	The Pigeons' Abyss	-	-26	929	Akovan - Zatriq	Upper Cretaceous Limestones
12	The Twin Abysses	The Twin Cave	-22	1608	Mokna Mountain	Middle and Upper Triassic limestones

4. The categorizaation by kind of values

4.1. The caves with faunistic values

From the speleological expeditions in the Kosovo caves, it was established that Kosovo caves are very rich in fauna. The caves fauna in Kosovo is relatively little

researched, but from the fragmented data it turns out to be extremely special and rich with representatives of several faunal groups. In the underground karstic cave environments in Kosovo (the inhabited cave - Zatriq, Radac Cave, Nekoc Cave, Dushi Cave, Kishnareka Cave, Kusari Caves, Shpella e Qirave (the Candles' Cave), Peshterri - Zatriq Cave, Devetaku Cave, etc.), there live 22 species of bats. Among them, 1 species of bat (*Rhinolophus blasii*, Blasius's horseshoe-nosed), which is present in the cave of Radac and in the cave of Zatriq (Gergavica), is in the category vulnerable (VU), 6 species of bats were found in the category near threatened (NT), 6 species in the category Least Concern (LC) and 9 species of bats in the category data deficient (DD).

Among the insects, the following species are known: *Pavicevicia comottiorum* Giachino, 2006 and *Pavicevicia pretneri* Perreau, 2008 (Ibrahimi et al., 2019) as well as some undetermined species up to the lowest taxonomic level and observed during several visits to the Kosovo caves as representatives of the family Curculionidae (order Coleoptera), *Diphyus quadripunctorius* (Müller, 1776), representative of the order Hymenoptera from the family Ichneumonidae, as well as the new finding for the fauna Kosovo caves *Troglophilus neglectus* Krauss, 1879 from the order Orthoptera. Undetermined representatives of the Trichoptera insect order from the Limnephilidae family were also observed from the caves. Among the Gastropods, namely the group of snails, the following species are known from the Kosovo caves: *Zebrina detrita* (Müller, 1774), *Jaminia quadridens* (O. F. Muller, 1774), as well as a representative of the Clausiliidae family undetermined to the lowest taxonomic level observed during visits to the Kosovo caves. Among Aranea, namely spiders, the following species are known: *Nesticus cellulanus* (Clerck, 1757), *Metellina merianae* (Scopoli, 1763), *Porrhomma convexum* (Westring, 1851) and *Tegenaria bosnica* (Dushi Cave) (Geci and Naumova, 2021). From the *Diplopoda* group, the following species are known: *Brachydesmus jalzici* Mšić, this species is endemic to the cave, and *Polydesmus undeviginti* Strasser, 1971 (Ibrahimi et al., 2019). Representatives of Chilopoda have also been observed in Zatriq Cave.

4.2. The caves with cultural heritage values

Caves as cultural heritage value - In Kosovo, there are a large number of inhabited caves, dating from the prehistoric period to the Middle Ages. The inhabited caves with archaeological and historical value in Kosovo are: Cave in Radac (archaeological site), Cave in Nekoc, the Black (Karamakazi) Cave, Dema's Cave, Cave in Kishnareka, Cave in Zatriq (Gergavica), the Monks' Cave, the Queen's Cave, Kallaba Cave, Resula Cave, Kusari Caves, Čërkolezi Cave, Hoxha (Imam's) Cave, etc. In terms of their spatial distribution in Kosovo, these caves are presented

on the map no. 3. In terms of the data about the historical period of their human presence, they are presented in the table no. 3.

Map 3. Caves of cultural heritage

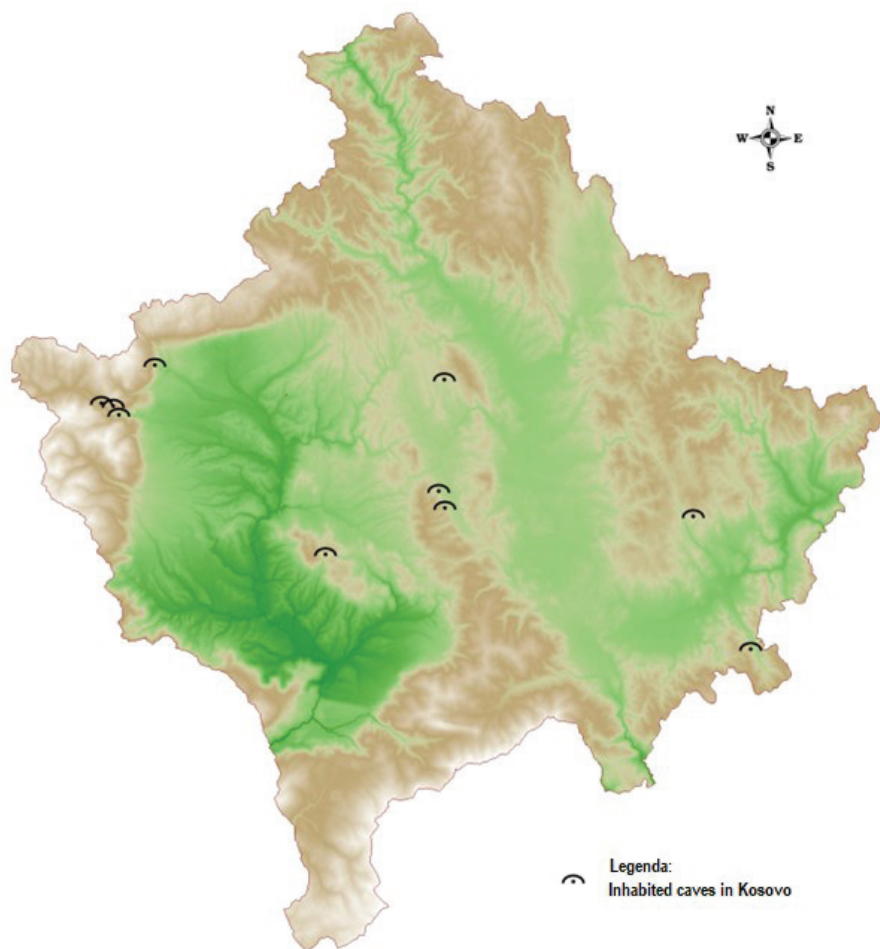


Table 3. Caves of cultural heritage

No.	Type of settlement	Toponym	Altitude (m)	Location	Era	Municipality
1	Cavy	Radac	578	At the water source of Drini i Bardhë	Paleolithic, Middle Bronze, Late Antiquity	Pejë
2	Cavy	Peshterr	810	Nekoc	Late Neolithic, Early Eneolithic	Drenas
3	Cavy	Peshterr	654	Kishnarekë	Late Neolithic	Drenas
4	Cavy	The Black – Karamakaze Cave	595	Rugova Canyon	Prehistoric, Middle Ages	Pejë
5	Cavy	The Queen's Cave	-	Rugova Canyon	Prehistoric, Middle Ages	Pejë
6	Cavy	Dema's Cave	562	At the entrance of Rugova Canyon	Prehistoric	Pejë
7	Cavy	Xhana's Holes	683	Cërkolez	Prehistoric, Antiquity	Istog
8	Cavy	The Imam's Cave	719	Lugu i Madh	Prehistoric, Ancient, Medieval, Modern	Istog
9	Cavy		848	Zatriq	Eneolithic, Bronze I	Rahovec
10	Cavy	The Monks' Cave	-	Rugova Canyon	Middle Ages	Pejë
11	Cavy	Ularica	370	M i r u s h a Waterfalls	Middle Ages	Klinë
12	Cavy	K o r i s h a Monastery	-	Korishë	Middle Ages	Prizren

4.3. The caves with hydrological values

Caves as a value of hydrological heritage - Some of the explored caves in Kosovo, such as: Cave in Radac, the Grand Canyon Cave, Cave in Panorc, Cave in Gadime, Devetaku Cave, Kusari Cave, etc., are considered as caves of high hydrological value and with important potential water resources for water use to supply the population with drinking water. The volume of the waterflow in the caves varies depending on the seasons of the year and on the atmospheric precipitation. In the Grand Canyon Cave, the minimum flow of the underground river occurs during (winter time) and it is about 15 l/s, while during the spring atmospheric precipitation and snow melting, the water flow level varies from 800 l/s up to 1.5 m³/s (photo 1). In the Cave of Panorci, according to measurements done in 2023 the minimum waterflow occurs in the dry period (September) with around 6 l/s, while the maximum waterflow occurs

in spring with 350 up to 400 l/s (photo 2). The Cave of Radac was created by the underground waterflow of the river of Drini i Bardhë, and characterized by a variable waterflow throughout the year. The largest water flow in the Radac Cave occurs in the spring season with $1.8 \text{ m}^3 / \text{s}$. In the Devetaku (Bats') Cave, based on the measurement carried out in the maximum waterflow occurs in April with, while 31 l/s, while the minimum waterflow occurs in September with about 5 l/s, (photo 3). The underground waterflow originates in the Kusari Cave, and flows along the entire corridor of the cave. Based on the hydrological measurements carried out in the cave during 2022, it was found that the waterflow in spring time is between 5 to 7 l/s (photo 4).

The potential use of these water resources in the caves of Kosovo, for the supply of the population with drinking water and for the economy in the future, should be done in a controlled manner, taking into consideration the protection of the caves ecosystems as well as thier hydroclimatic parameters (flows, temperature, air humidity, etc.), according to acceptable standards. Although in the last decades Kosovo has been faced with the lack of drinking water, the hydric potentials for the use of water in the caves of Kosovo are very large. The waterstress for drinking water in Kosovo may impose to the responsible institutions responsible the use of water resources from inside the caves.



Photo 1. The underground river in the Grand Canyon Cave



Photo 2. The underground river in the Cave of Panorci



Photo 3. The underground river in the Cave of Devetak



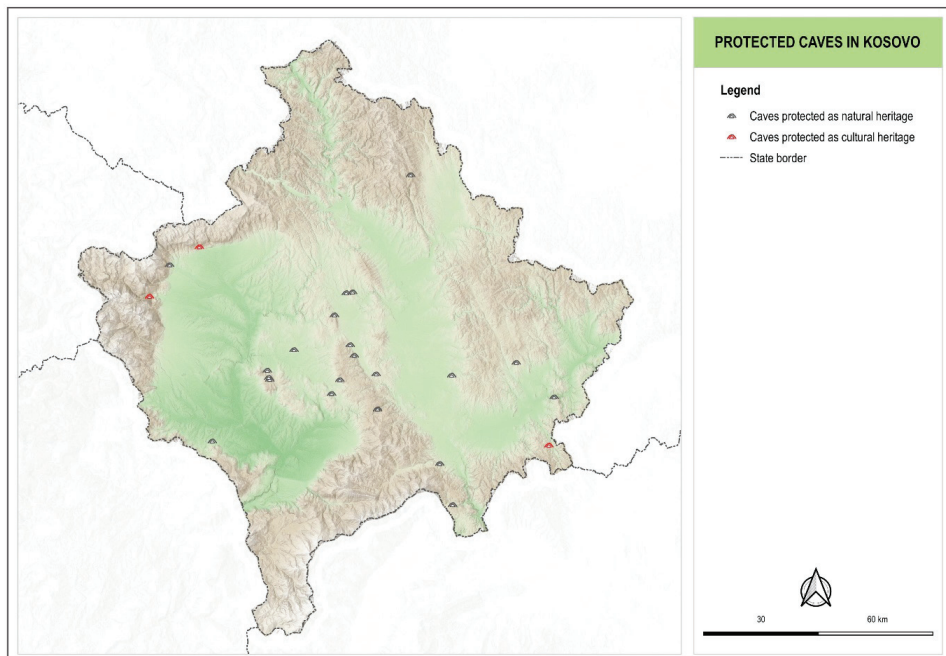
Photo 4. The underground river in the Kusari Cave

4.4. The protected area caves

The protected caves in Kosovo are 20, and they cover an area of 460.05 ha, or 0.4 % of the overall area of protected areas (map 5) of the country. A large number of caves are situated within protected areas such as in: the National Park “Bjeshkët e Nemuna” (Gryka e Madhe / The Great Canyon Cave, Gërshërët e Zeza / The Black Scissors Cave, Shpella e Borës / The Cave of Snow, Shpella të Thepi i Qverlit / the Cave at the Qverli Ridge, Shpella të Shpati i Lajthisë / the Cave at the Hazelnuts Slope, Shpella e Gurit të Sokolit / the Cave of Kestrel’s Rock, Shpella te Podi i Veselajve / the Cave at Veselajs’ Plain, Shpella te Podi i Liqenit / the Cave at the Lake’s Plain, Shpella e Haxhi Kadrisë / the Cave of Haxhi Kadria, Shpella te Kërshi i Bardhë / the Cave at the White Rocks, etc.). In the National Park “Sharri” there are approximately 30 speleological objects, with an area of approximately 5,311.9 m², and with a total of 994.5 m, of underground corridors and galleries.

The most important caves and abysses in the National Park “Sharri” are: Humnera e Marinës (Marina’s Abyss), Humnera e Zgatarit (the Abyss of Zgatar), Shpella e Kishës (the Church’s Cave), Shpella e Rrasës (The Slab’s Cave), etc.

Map 5. Protected Caves in Kosovo (2023)



5. Conclusions

The lack of geoinformation about the caves in Kosovo constitutes a weakness which makes difficult the process of informing the public, specially about the existence and value of these caves. This represents also a problem for the local and central institutions, and also for the nature lovers, who are interested in their protection and management. Under these circumstances, there is an imminent need to establish geoinformation on the caves which would serve researchers, cave managers and the public. Geoinformation will consist in the digitalization of the database (geological, archaeological, hydrological, biological, historical, touristic and educational) of all the caves in Kosovo. Caves geoinformation will serve not only as a digital database, which shall occasionally be updated, but will also serve to inform tourists passionate about speleology. In Kosovo, a full inventory of speleological heritage objects is missing, as well as many caves with great natural and scientific values have not been explored and have not been taken under legal protection. Although in Kosovo 20 caves have been protected by law by local and central institutions, only for two caves has the body for their management been established.

6. Recommendations

There should be established a complete inventory of all speleological heritage objects in Kosovo. There shall be proposed the law on the protection of caves, which will affect higher legal protection, preservation and conservation of speleological heritage in Kosovo. This law will include all levels of protection (protected and strictly protected) by categorizing caves according to scientific values, the bodies responsible for protection and the manner of managing caves for scientific, cultural, educational and touristic purposes, etc. There should be conducted research of new corridors and galleries in the Cave of Gadime, the Cave of Dushi, the Cave of Panorc, the Caves of Kusari, as well as the preparation of infrastructure for tourists.

From the research expeditions in the caves, it has been established that the caves of Kosovo have a very rich biodiversity. It is recommended that in the future a full research/inventory of caves flora and fauna be done by experts in the relevant field and the documentation of the presence of species and habitats found in the caves of Kosovo. In the curriculum of geography subjects in pre-university and university education (department of geography, University of Prishtina), there should be included Speleological Heritage and the protection of karst ecosystems. During the exploration and research of the caves in Kosovo, it was established that in the caves there are many traces and fragments of early historical periods, when people used the

caves as shelters to live and protect their families. Therefore, it is recommended the research of these caves by archeology experts.

It is recommended the placement of information boards for touristic caves along the main roads of Kosovo such as: highways, motorways, regional roads, etc., as well as in the vicinity of the border entry points and at the International Airport “Adem Jashari”. The values of the speleological heritage of Kosovo should be promoted in tourist guides, TV, educational programs, symposia, conferences in the country and abroad, etc. The tourist attendance of the caves generates considerable income, which, if put to good use in the management of the caves, the improvement of the tourist infrastructure and their promotion, would lead to an increase in the number of visitors and, as a consequence, also in economic income. The application of ticketed entry as well as the application of visitor monitoring systems would guarantee valuable statistics for economic and tourism analysis in the future.

References

Published by the International Union of Speleology (UIS) and the International Union for Conservation of Nature (IUCN) “Guidelines for Cave and Karst Protection”, 2022.

Ministry of Culture, Youth and Sport, Archaeological Institute of Kosovo; “Archaeological Map of Kosovo” Volume II, Prishtina 2012.

Kosova Academy of Sciences and Arts; “Archaeological Map of Kosovo I”, Prishtina, 2006.

Ibrahim Ahmet; “Karst terrains in ASP of Kosovo”, Bulletin 7, FMNS (Faculty of Mathematics and Nature Sciences), Prishtina, 1981.

Fadil Bajraktari, Sami Behrami, Fatos Katallozi; “Cave in Kosovo”, ProGEO-Kosova, Prishtinë, 2010.

Fadil Bajraktari; “SPELEOMEDIT - Mediterranean Speleology”, (Kosovo Part), Tetide APS - Marina di Camerota Società Speleologica Italiana - Bologna, Italy 2021.

Fadil Bajraktari, Romeo Hanxhari, Sami Behrami; “Kosovo Abysses (Vertical Caves)”, 30th International Karstological School Classical Karst. Abstracts & Guide Book, Postojna, 2023.

Fadil Bajraktari, Romeo Hanxhari, Hazir Çadraku, Riza Murseli; “Necessity of

establishing geoinformation for speleological heritage objects in Kosovo”, 31st International Karstological School “Classical karst”, data acquisition and analysis in karst systems. Karst Research Institute ZRC SAZU, Postonja, Slovenia, 17-21 June 2024.

Fadil Bajraktari, Riza Hajdari; “Speleoturistic Potentials in the River Basin of Mirusha”, 26th International Karstological School “Classical Karst” Show Caves and Science. Postojnae, Slovenia. 2018.

Fadil Bajraktari, Sami Behrami, Nazmi Zogaj; “Inhabited Caves in Kosovo”, 6th International Conference of Ecosystems, Tirana, Albania 2016.

Fadil Bajraktari; “Protection of karst caves in Kosovo”, 20th International Karstological School “Classical Karst”, Karst forms and Processes. Postonja, Slovenia, June 18th to 23rd, 2012.

Karst Research Institute ZRC / SAZU; “Pressures and Protection of the Underground Karst-Cases from Slovenia and Croatia”, Postonja, 2011.

Donard Geci, Maria Naumova; “A preliminary checklist of spiders (Arachnida; Araneae) of Kosovo”, Ecologia Balcanica, Special Edition 4. 1-11. 2021.

Haxhi Mehmetaj; “Archaeological Heritage of the Municipality of Istog”, Archaeological Institute of Kosovo, Pristina, 2016.

Merita Dollma, Roven Hoxha; “Geoinformation of Caves in Albania”, International Geo-Science Conference “GeoAlb 2011” Mineral Resources and their perspective, Mitrovic, Kosovo, 2011.

Jan Šmoll, Branislav Šmida; “Velika klisura (Gryka e Madhe) in Kosovo - the discovery and exploration of one of the biggest cave systems at Balkan”. For the 14 Speleological Congress UIS in Greece, 2005.

Independent Commission for Nines and Minerals; “Geological map of Kosovo”, 2006.

MESPI, KEPA, KINP; “State of Nature Report 2018-2021”, Prishtina 2023.